



ELECTRONIC DATA-PROCESSING MACHINES

SOLUTIONS TO  
TYPE 705 PRACTICE PROBLEMS

International Business Machines Corporation  
New York, New York  
Form 22-6646-0



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A 4 3 2 - 1 G E N E R A T O R b b b 1 2 3 0 0 3 9 5 0 ++																			
7001 Part No.		7006 Description										7018 Quan		7021 Cost		7027		7028	
2 0 2 0 0 Y 7 0 0 1 2 0 3 0 0 R 7 0 0 1 1 0 0 0 4																			
0000 Instr. 1		0004 Instr. 2		0009 Instr. 3		0014 Instr. 4		0019 Instr. 5		0024									
01		02		03		04		05		06		07		08					
09		10		11		12		13		14		15							
INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00		SIGN	AUXILIARY STORAGE 01-15		SIGN	EXPLANATION									
	OPER.	ADDRESS																	
0004	Sel	0200								Select tape unit #1									
0009	Read	7001								Read tape record into memory									
0014	Sel	0300								Select card punch #1									
0019	Write	7001	00							Punch record in card									
0024	Tr	0004								Transfer to start.									

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Part No.	Quantity	Unit Cost	As Req	Qty Req	Total Cost
0403	0408	0416	0418	0423	0429
0430	0411	0416	0418	0423	0429

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J	O	H	N	b	J	.	b	D	O	E	b	b	b	b	b	0	1	3	1	5	4	7	4	2	5	0	1	0	2	0	1	b	b	b	b	b	b	b	b	b	b
9015	Name																9030	Dp	9032	+	9033	+	Rate	9037	Hr.	9040	Ded.	9045	Current	9050	Gross										
b	b	b	b	b	b	#				1	3	0	0	1	8																										
9055	Net Pay		9060	9061	0500	Exem Amt.	0503	%	0505																																

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Problem 11

Memory	Accumulator Before	Acc. Sign	Accumulator After	Acc. Sign	
<u>ADD</u> $\begin{smallmatrix} \dagger \\ 3265 \end{smallmatrix}$	a55	+	a320	+	Overflow Check Ind.  Sign Check Ind.
$\begin{smallmatrix} \dagger \\ b79 \end{smallmatrix}$	a33	+	a112	+	
A650	a320	-	a330	+	
<u>SUB</u> $\begin{smallmatrix} \dagger \dagger \\ 63276 \end{smallmatrix}$	a200	+	a076	-	Sign Check Ind.  Overflow Check Ind.
b38	a38	+	a00	+	
$\begin{smallmatrix} \dagger \\ A87 \end{smallmatrix}$	a14	-	a101	-	
<u>R ADD</u> $\begin{smallmatrix} \dagger \\ 3721 \end{smallmatrix}$	a0	+	a721	-	Sign Check Ind.
$\begin{smallmatrix} \dagger \\ AB124 \end{smallmatrix}$	a91	-	a124	+	
b318	aCA4	-	a318	+	
<u>R SUB</u> A127	a0	+	a127	-	Sign Check Ind.
$\begin{smallmatrix} \dagger \\ 6322 \end{smallmatrix}$	a1279	-	a322	+	
$\begin{smallmatrix} \dagger \\ 1837653 \end{smallmatrix}$	a6273	+	a837653	-	
<u>MPY</u> $\begin{smallmatrix} \dagger \dagger \\ 525 \end{smallmatrix}$	a4	+	a100	+	Sign Check Ind.
b330	a02	-	a00660	-	
$\begin{smallmatrix} \dagger \\ 55 \end{smallmatrix}$	a6	-	a30	+	
<u>DIV</u> $\begin{smallmatrix} \dagger \dagger \\ 222 \end{smallmatrix}$	a088	-	a4	-	Overflow and Zero Ind.
$\begin{smallmatrix} \dagger \\ b20 \end{smallmatrix}$	a600	+	a0	+	
$\begin{smallmatrix} \dagger \\ A5 \end{smallmatrix}$	a0295	+	a059	+	
<u>STORE</u> $\begin{smallmatrix} \dagger \dagger \\ 37298 \end{smallmatrix}$	a22	-	Memory After $\begin{smallmatrix} \dagger \dagger \\ 37222 \end{smallmatrix}$		
$\begin{smallmatrix} \dagger \dagger \\ 65421 \end{smallmatrix}$	a321	+	$\begin{smallmatrix} \dagger \\ 65321 \end{smallmatrix}$		
ABC215	a216	+	ABC216		



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INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0001	01			a0		Prepare ASU 01
0009	Load	1505	01			a $\neq$	+	Group mark
0014	Unload	2060	01					Put group mark in output record
0034	Sel	0200						Input tape unit
0039	Read	6000						Read record
0044	RCV	1564						Designate output area
0049	Tsmt	6004	00					Transmit to output area
0054	Sel	0201						Output tape unit
0059	Write	1560	00					Write record
0064	Tr	0034						Tr to start of main routine.

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0004	13					Prepare ASU 13
0009	Set L	0007	14					Prepare ASU 14
0014	Set L	0001	15					Prepare ASU 15
0019	Load	0905	15			a $\neq$	+	Group mark
0024	Unload	6227	15					Put G/M at end of output area
0064	Sel	0200						Input tape unit
0069	Read	1017						Read record
0074	RCV	6212						Designate output field C
0079	Tsmt	1028	13					Transmit field C
0084	Tsmt	1017	13					Transmit field A
0089	Tsmt	1021	14					Transmit field B
0094	Sel	0201						Output tape
0099	Write	6212	00					Write record
0104	Tr	0064						Tr to start of main routine

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0004	06					Prepare ASU 06
0009	Set L	0001	07					Prepare ASU 07
0014	Load	0000	07			a #	+	Group mark
0019	Unload	5065	07					Put G/M at end of output record
0024	Unload	9370	07					Put G/M at end of variation record
0029	Set L	0005	05					Prepare ASU 05
0099	Sel	0200						Input master tape
0104	Read	6035						Read record
0109	Sel	0201						Input variation tape
0114	Read	9361						Read record
0119	Load	9365	05					Load employee no.
0124	Comp	6039	05					Comp employee numbers
0129	Tr Eq	0154						Transfer on equal
0134	Tr Hi	0164	00					Transfer on high
0139	Sel	0500						Select typewriter
0144	Write	9361	00					Write variation record
0149	Tr	0099						Transfer
0154	RCV	6040						Designate master rate field
0159	Tsmt	9366	06					Transmit rate
0164	RCV	5054						Designate output work area
0169	Tsmt	6039	00					Transmit master record
0174	Sel	0202						Select output tape
0179	Write	5050	00					Write record
0184	Tr	0099						Transfer to start

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0001	01			a 0	+	Prepare ASU 01
0009	Load	1505	01			a #	+	Group mark
0014	Unload	2060	01					Put G/M in output record
0019	Sel	0200						Input tape unit
0024	Read	6000						Read first record
0034	RCV	1584						Designate output work area
0039	Tsmt	6004	00					Transmit to output work area
0044	Sel	0200						Input tape unit
0049	R/W	6000						Prepare to read while writing
0054	Sel	0201						Output tape unit
0059	Write	1580	00					Read and write simultaneously
0064	Tr	0034						Transfer to main routine.

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Memory	Acc. Storage Before	Acc. Sign	Acc. Storage After	Acc. Sign	Check Indicators
<u>ADD</u> $\begin{smallmatrix} + & + \\ 6573 \end{smallmatrix}$	a61	-	a512	+	Sign Check
b82V	a134	+	a959	+	
$\begin{smallmatrix} + & - \\ 62243 \end{smallmatrix}$	a3765	+	1522	+	
<u>SUB</u> A827	a28	-	a855	-	Sign Check
$\begin{smallmatrix} + & + \\ 7376 \end{smallmatrix}$	a12781	+	a12405	+	
$\begin{smallmatrix} + & - \\ 73274 \end{smallmatrix}$	a3274	-	a0000	+	
<u>R ADD</u> b83S	a7215	-	a832	+	Sign Check
$\begin{smallmatrix} + \\ K375 \end{smallmatrix}$	a16	+	a375	+	
$\begin{smallmatrix} + & - & - \\ 54381 \end{smallmatrix}$	a9654	+	a381	-	
<u>R SUB</u> $\begin{smallmatrix} + & - \\ 421 \end{smallmatrix}$	a521	+	a21	+	Sign Check
b538X	a151	-	a387	-	
$\begin{smallmatrix} + & + \\ 53743 \end{smallmatrix}$	a9	+	a3743	-	
<u>MPY</u> $\begin{smallmatrix} - & 5 & 0 \\ D120 \end{smallmatrix}$	a5	-	a300	+	Sign Check
$\begin{smallmatrix} + \\ b15 \end{smallmatrix}$	a003	+	a000360	+	
	a325	-	a04875	-	
<u>DIV</u> $\begin{smallmatrix} + & + \\ 765 \end{smallmatrix}$	a70	+	a70	+	Zero indicator
$\begin{smallmatrix} + \\ b5 \end{smallmatrix}$	a075	+	a15	+	
$\begin{smallmatrix} + \\ b5 \end{smallmatrix}$	a75	+	a0	+	
A9	a81	+	a9	+	Overflow and Zero Check Sign Check
<u>LOAD</u> A36 $\begin{smallmatrix} + \\ DOEbJ \end{smallmatrix}$	a9	-	$\begin{smallmatrix} + \\ a6 \end{smallmatrix}$	+	
DOEbJ	a65431	+	aDOEbJ	+	
$\begin{smallmatrix} - & + \\ 563AB5 \end{smallmatrix}$	a32761	+	$\begin{smallmatrix} - & + \\ a63AB5 \end{smallmatrix}$	+	



	Accumulator Storage	Acc. Sign	Memory Before	Memory After
STORE	a37	-	$643382^+$	$643337^+$
	a37982	+	$A65213A^+$	$A637982^+$
	a21	+	$DOEb15^+$	$DOEb21^+$
	a7	-	bA76532	$bA76537^+$
UNLOAD	a219	+	$bAB5600^+$	bAB5219
	aDOEbJ	+	$DOEbM56^-$	DODOEbJ
	a15	-	$77B4681^+$	$77B4615^-$

Instruction		Accumulator Storage Before	Acc. Sign	Accumulator Storage After	Acc. Sign
SHOR	0001	a3976	+	a397	+
LENG	0002	a7653	+	a765300	+
SHOR	0002	a375	-	a3	-
LENG	0000	a5762	+	a5762	+
SET L	0004	a006512	+	a6512	+
SET L	0005	a372	-	a00372	-
ROUND	0001	a796	+	a80	+
ROUND	0003	a37352	+	a37	+
ROUND	0004	a68712	-	a7	-

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0001	01			a0	+	
0009	Load	1013	01			a*	+	Group mark
0014	Unload	2061	01					Put G/M in output record
0019	Set L	0004	02			a0000	+	4 zeros for no W.H.
0024	Set L	0003	03			a000	+	3 zeros for no FICA
0029	Sel	0200						Input tape
0034	Read	1150						Read first record
								Transmit record to output area
0039	RCV	2024						Designate output area
0044	Tsmt	1154	00					Transmit to output area
								Test for withholding tax
0049	R Add	2027	00	a5	+			Tax class
0054	Mpy	1003	00	a06500	-			Tax class x 13.00 = exmpt. amt.
0059	Add	2048	00	a12075	+			Gross - exmpt. amt. = tax. gross
0064	Tr Pls	0079	00					To calc. withholding tax
0069	Store	2052	02					No withholding tax - put 4 zeros
								in output
0074	Tr	0104						To test for FICA
								Calc. withholding tax
0079	Mpy	1005	00	a0217350	+			Taxable amt. x 18% w.h. tax
0084	Round	0002	00	a02174	+			Adjust to nearest cent
0089	Set L	0004	00	a2174	+			Adjust to 4 places
0094	Store	2052	00					Put w.h. tax in output record
0099	Add Mem	2039	00					Adjust y.t.d. w.h. tax
								Test for FICA
0104	R Add	1012	00	a420000	+			42000
0109	Subt	2033	00	a005000	+			Y.t.d. gross
0114	Tr Pls	0129	00					To test for partial FICA
0119	Store	2055	03					No FICA - put 3 zeros in output
0124	Tr	0179						To calc. net pay
0129	Subt	2048	00	a013575	-			Gross
0134	Tr Pls	0149	00					To full FICA calc.
								Partial FICA calc.
0139	Add	2048	00	a005000	+			Add back gross
0144	Tr	0154						To multiply by 2%

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
								Full FICA calc.
0149	R Add	2048	00	a18575	+			Gross
0154	Mpy	1006	00	a0010000	+			Gross x 2% = FICA
0159	Round	0002	00	a00100	+			Adjust FICA to nearest cent
0164	Set L	0003	00	a100	+			Adjust to 3 places
0169	Store	2055	00					Put FICA in output record
0174	Add Mem	2043	00					Adjust y. t. d. FICA
								Calc. net pay
0179	R Add	2048	00	a18575	+			Gross
0184	Add Mem	2033	00					Adjust y. t. d. gross
0189	Subt	2052	00	a16401	+			Withholding tax
0194	Subt	2055	00	a16301	+			FICA
0199	Store	2060	00					Put net pay in output record
								Write record
0204	Sel	0200						Input tape
0209	R/W	1150						Prepare input to read
0214	Sel	0201						Output tape
0219	Write	2020	00					Write record and read simul.
0224	Tr Sig	0284						End of output tape
0229	Sel	0200						Sel Input tape unit
0234	Tr Sig	0344						End of input file
0239	Tr	0039						Transfer to start
0284	Ctrl	0001						Tape mark on output tape
0289	Ctrl	0002						Rewind output tape
0294	STOP	0001						Stop
0299	Tr	0229						Transfer to Sel input tape
0344	Ctrl	0002						Rewind input tape
0349	Sel	0201						Select output
0354	Ctrl	0001						Tape mark on output tape
0359	Ctrl	0002						Rewind output tape
0364	STOP	0002						End of job



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### Output

- I. Set L  
Load  
Comp  
Tr Hi  
Tr Eq
- II. R Add  
Comp  
Tr Hi  
Tr Eq
- III. R Add           4063           XXXXXX.XX  
Set L           0008           OXXXXX.XX  
Leng           0002           OXXXXX.XXOO  
Div           4067           XX.XXXX  
Round          0001           XX.XXX  
Store          4072
- IV. 1. If size of sum is longer than either operand when adding and subtracting.  
2. Value of divisor is < or = same number of digits on left side of dividend.  
3. Overflow when rounding.  
Turn OFF by interrogating 0904 by Sel 0904 and Tr Sig instructions.
- V. Store - Moves sign of accumulator with unit digit stored  
Operates on only numerical part of characters  
Checks position on left of high order digit stored.  
If it is a number, it signs if plus.
- Unload - Moves characters as they appear  
Sign of accumulator has no effect.
- VI. R Add                   Non-Numerical character in memory  
Read (from tape)       Inter-record gap  
Unload                "a" storage mark  
Subtract               Non-Numerical character and storage mark  
Write                 00 Group Mark (01) 20,000 memory position  
Read (from card)       End of card  
Store                 "a" storage mark  
Load                 "a" storage mark  
Read (from drum)       Drum mark  
Compare               "a" mark  
Multiply               "a" storage mark  
ADD Memory  
    (signed field)       Non-Numerical character  
ADD Memory  
    (unsigned field)     "a" storage mark  
Transmit 00            R/M in units position of any five characters  
                         transmitted  
Transmit 01-15         "a" storage mark



VII. Sum of number of digits in multiplier and multiplicand

Difference between number of digits in divisor and dividend

VIII. a0145638

Round	0004	a015
Set L	0002	a15
Leng	0002	a1500

IX.	Tape (Write Status)	Reflective Spot
	Tape (Read Status)	Tape Mark
	Card Reader	Read instruction following processing of last card
	Printer	Hole in channel 12 of carriage tape
	Drum	Attempting to read or write off drum

X. The zone bit structure over the tens and hundreds position of the address.

XI. Any end of file or check indicator will cause the Tr Any instruction to be effective.

XII. (a) When an invalid character is sensed when moving characters from memory to the record storage unit.

(b) An unequal comparison between the odd-even longitudinal count of the numerical portion of the characters moved from memory to the record storage unit and an odd-even type wheel echo impulse longitudinal count of the numeric portion of the character printed.

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIGN	AUXILIARY STORAGE 01-15	Z SIGN	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0005	00	a00000	+			Prepare accum. 5 positions
0009	Load	5774	00					Load first number
0014	Comp	5779	00					Compare first and second number
0019	Tr Hi	0039						If first number is high go to 0039
0024	Comp	5884	00					If low number compare to 3
0029	Tr Hi	0059						If number is high go to 0059
0034	Tr	0064						If number is low number is found
0039	Load	5779	00					Load number 2
0044	Comp	5884	00					Compare 2 to 3
0049	Tr Hi	0059						If number 2 is high, go to 0059
0054	Tr	0064						If number 2 is low, go to 0064
0059	Load	5884	00					Load number 3
0064	Unload	9004	00					Unload low number
0069	Stop	0001						Stop machine.

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIGN	AUXILIARY STORAGE 01-15	Z SIGN	EXPLANATION
	OPER.	ADDRESS						
0004	R Add	1904	01			a0003	+	Constant 0003
0009	R Add	1908	02			a0006	+	Constant 0006
0014	R Add	1912	03			a1003	+	Address of first 3 digit total
0019	R Add	1916	04			a1306	+	Address of first 6 digit total
0024	R Add	1920	05			a1300	+	Address of last 3 digit total
1029	Unload	1039	03			a1003		Adjust to first 3 digit address
1034	Unload	1044	04			a1306		Adjust to first 6 digit address
1039	R Add	(1003)	00					3 digit total
1044	Add Mem	(1306)	00					3 digit total and 6 digit total
1049	Comp	1039	05					Comp. address of last 6 dig. tot.
1054	Tr Eq	1074						Continue program
1059	Add Mem	1039	01					Increase r add address by 3
1064	Add Mem	1044	02					Increase add mem address by 3
1069	Tr	1039						To repeat accumulation
1074								Continue program
	Tr	1029						Repeat program.

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	N SIG	EXPLANATION
	OPER.	ADDRESS						
0004	R Add	3065	03			a5	+	
0009	Sel	0201						Input tape unit
0014	Read	--						Read record
0019	Tr Sig	0294						End of file
0024								
0169	Sel	0203						Output tape unit
0174	Write	--	00					Write record
0179	Tr Sig	0324						End of file
0184	Tr	0009						
0294	Ctrl	0002						Rewind input tape
0299	Add Mem	0009	03					Change input tape addr.
0304	Tr	0009						To read record
0324	Ctrl	0001						Record tape mark on output tape
0329	Ctrl	0002						Rewind tape
0334	Add Mem	0169	03					Change output tape addr.
0339	Tr	0009						Continue program

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	N SIG	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0001	01					
0009	Load	1560	01			a 3	+	Group mark
0014	Unload	3034	01					
0019	Set L	0003	02			a000	+	
0024	Set L	0005	03			a00000	+	
0029	Sel	0200						Input tape unit
0034	Read	3001						Master record
0039	(No Op)	0114						Switch
0044	Sel	0100						Card reader
0049	Read	2021						Change card
0054	Load	2025	03			a64027	+	Employee no.
0059	Comp	3005	03					Card vs. master
0064	Tr Hi	0104						Tr to set switch
0069	Tr Eq	0079						Tr to change rate
0074	Stop	0001						Unmatched card - stop
0079	RCV	3031						Rate from card and put
0084	Tsmt	2026	02					put rate in master
0089	Sel	0201						Output tape
0094	Write	3001	00					Master record
0099	Tr	0029						To read another record
0104	Sign	0035	00	a&	+			Set switch to B
0109	Tr	0089						To write master
0114	Sign	0035	00	a&	+			&
0119	Add Mem	0035	00					Set switch to A
0124	Tr	0059						To compare.

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0001	01					
0009	Load	1563	01			a $\neq$		Group mark
0014	Unload	2040	01					Put G/M at end of master record
0019	Unload	1518	01					Put G/M at end of detail record
0024	Set L	0004	02			a0000+		
0029	Sel	0200						Input tape
0034	Read	2001						Read master record
0039	Sel	0201						Input tape
0044	Read	1502						Read detail record
0049	Load	1505	02			aA149	+	Detail product no.
0054	Comp	2004	02					Detail vs. master
0059	Tr Eq	0084						Detail = master
0064	Sign	0064	03			a&	+	&
0069	Add Mem	0080	03					Set switch to A (No Op)
0074	Tr Hi	0119						Detail > master
0079	Stop	0001						Unmatched detail
0084	(No Op)	0104						Switch
0089	Sign	0080	03			a&	+	Set switch to B (Tr)
0094	Sel	0202						Output tape
0099	Write	2001	00					Write master record
0104	Sel	0202						Output tape
0109	Write	1502	00					Write detail line
0114	Tr	0039						To read another detail
0119	Sel	0200						Output tape
0124	Read	2001						Read master record
0129	Tr	0054						To comp detail vs. master
								To beginning.

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SIG	AUXILIARY STORAGE 01-15	Z SIG	EXPLANATION
	OPER.	ADDRESS						
0404	R Add	0910	01			a09	+	Code from trans. record
0409	Comp	0612	01					01
0414	Tr Eq	--						Sub routine for 01
0419	Comp	0614	01					04
0424	Tr Eq	--						Sub routine for 04
0429	Comp	0616	01					09
0434	Tr Eq	--						Sub routine for 09
0439	Comp	0618	01					26
0444	Tr Eq	--						Sub routine for 26
0449	Comp	0620	01					34
0454	Tr Eq	--						Sub routine for 34
0459	Stop	0001						Unmatched trans. record.

INSTR. LOCATION	INSTRUCTION		STOR. CODE	ACCUMULATOR 00	Z SOS	AUXILIARY STORAGE 01-15	Z SOS	EXPLANATION
	OPER.	ADDRESS						
0004	Set L	0004	01					
0009	Load	0917	01			a9979	+	Address of first code
0014	Unload	0034	01			a9979		Set transfer
0019	R Add	0910	00	a6	+			Code
0024	Mpy	0913	00	a0030	+			x005
0029	Add Mem	0034	00					Adjust pivot address
0034	Tr	(0009)						Transfer address
9979	Tr	--						0 sub routine
9984	Tr	--						1 sub routine
9989	Tr	--						2 sub routine
9994	Tr	--						3 sub routine
9999	Tr	--						4 sub routine
0004	Tr	--						5 sub routine
0009	Tr	--						6 sub routine
0014	Tr	--						7 sub routine
0019	Stop	0001						8
0024	Stop	0001						9
								Note:
								To begin routine for next
								transaction, transfer to 0014.

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APPLICATION Sales Discount - Problem 36

CLASS	LENGTH	SYMBOLIC LOCATION	OPERATION	ACCUM	ADDRESS	ADDRESS INCREMENT ±	SIGN	DATA OR DESCRIPTION
6		00   00   0			0   00   0			Assignment Entry
7		00   00   1						Sales discount problem
7		06   00   0						Sales record
5 006		06   01   0						Invoice number
5 005		06   02   0						Date
5 033		06   03   0						Customer name and address
5 006		06   04   0						Gross sales
5 002		06   05   0						Discount %
5 005		06   06   0						Discount amount
5 006		06   07   0						Net sales
5 001		06   08   0						Group mark
7		05   00   0						Constant data
2 002		05   01   0					+	b2
2 001		05   02   0					+	3
2 006		05   03   0					+	010000
2 001		05   04   0					≠	
7		01   00   0						Program instructions
1		01   01   0	SET	01	0   00   1			Prepare storage unit 01
		02	LOD	01	05   04   0			Load group mark
		03	UNL	01	06   08   0			Place group mark at end of record
1		04	SET	02	0   00   6			Prepare storage unit 02
		05	LOD	02	05   03   0			Load one hundred dollars
1		02   01   0	SEL		0   20   0			Select input tape unit
		02	RD		06   01   0	- 005		Read record into memory
		03	CMP	02	06   04   0			Compare 010000 to gross sales
		04	TRH		04   01   0			Gross sales less than 100.00
		05	TRE		04   01   0			Gross sales equal to 100.00
		03   01   0	RAD	00	05   02   0			R add 3 percent
		02   0	TR		04   02   0			Transfer for calculation
		04   01   0	RAD	00	05   01   0			R add 2 percent
		02	ST	00	06   05   0			Store percent in record
		03	MPY	00	06   04   0			Gross sales x percent
1		04	RND	00	0   00   2			Round result
		05	ST	00	06   06   0			Store discount amount
		06	RSU	00	06   06   0			R Sub discount amount
		07	ADD	00	06   04   0			Add gross sales
		08	ST	00	06   07   0			Store net sales
1		09	SEL		0   20   1			Select output tape
		10	WR	00	06   01   0	- 005		Write record
		11	TR		02   01   0			Transfer to read input tape

CLASS	LENGTH	SYMBOLIC LOCATION	OPERATION	ACCUM.	ADDRESS	ADDRESS INCREMENT ±	SIGN	DATA OR DESCRIPTION
6		00 00 0			01 00 0			Assignment Entry
7		10 00 0						Input record
5	006	10 01 0						Item code
5	030	10 02 0						Description
5	005	10 03 0						Quantity
5	005	10 04 0						Unit cost
7		11 00 0						Output record
5	006	11 01 0						Item code
5	031	11 02 0						Description
5	007	11 03 0						Quantity
5	007	11 04 0						Unit cost
5	013	11 05 0						Value
5	001	11 06 0						Group mark
7		09 00 0						Constants
2	001	09 01 0						. (period)
2	001	09 02 0						, (comma)
2	001	09 03 0						≡ (group mark)
					Program			
1		01 01 0	SET	01	0 00 1			Prepare auxiliary storage unit 01
		02	LOD	01	09 01 0			Load period
		03	UNL	01	11 04 0	- 004		Unload period in unit cost
		04	UNL	01	11 05 0	- 003		Unload period in value
		05	LOD	01	09 03 0			Load group mark
		06	UNL	01	11 06 0			Unload group mark at end of print line
1		07	SET	02	0 03 0			Set L storage unit 02
1		08	SET	04	0 00 16			Set L storage unit 04
1		09	SEL		0 20 0			Select input tape
		10	RD		10 01 0	- 005		Read input tape
		02 01 0	LOD	01	09 02 0			Load comma
		02	UNL	01	11 05 0	- 007		Unload comma into value print line
		03	UNL	01	11 05 0	- 011		Unload comma into value print line
		04	RCV		11 01 0	- 005		Receive instructions for item code
		05	TMT	04	10 01 0	- 005		Transmit code to print line
		06	RCV		11 01 0	+ 002		Receive instruction for description
		07	TMT	02	10 01 0	+ 001		Transmit description to print line
		08	RAD	00	10 03 0			R add quantity
		09	SPR	00	11 03 0			Store for print in print line
		10	MPY	00	10 04 0			Mpy by unit cost ± value
1		11	RND	00	0 00 1			Round answer by 1
		12	SPR	00	11 05 0			Store for print value in print line
		13	RAD	00	10 04 0			R add unit cost
		14	SPR	00	11 04 0			Store for print unit cost in print line
1		15	SEL		0 20 0			Select input tape for R/W
1		16	RWW		10 01 0	- 005		R/W prepare to read while writing
1		17	SEL		0 20 1			Select output tape
		18	WR	00	11 01 0	- 005		Read and write simultaneously
		19	TR		02 01 0			Transfer for next record



CLASS	LENGTH	SYMBOLIC LOCATION	OPERATION	ACCUM.	ADDRESS	ADDRESS INCRE- MENT		SIGN	DATA OR DESCRIPTION
						±			
		01 01 0	SGN		06 01 0				
		02	SGN		06 02 0				Restore alternator constant to minus
		03	ADM		06 02 0				
		04	ADM		06 01 0				
1		05	SEL		0 20 0			Select input tape	
		06	RD		12 01 0	-	005		Read a record into memory
1		07	SEL		0 90 2				Select R/W check indicator
		08	TRS		05 01 0				Transfer to R/W error routine
		09							Normal routine
1		05 01 0	SEL		0 20 0				Select input tape
1		02	BSP						Backspace tape
		03	RSU		06 01 0				Change sign of 1 to plus
		04	ST		06 01 0				Store 1 as plus
		05	TRP		01 06 0				If plus transfer to read
1		06	HLT		0 00 1				Error second read
		07	TR		01 01 0				
7		06 00 0							Constants
2	002	06 01 0						-	b1
2	001	06 02 0						-	5

CLASS	LENGTH	SYMBOLIC LOCATION	OPERATION	ACCUM.	ADDRESS	ADDRESS INCREMENT $\pm$	SIGN	DATA OR DESCRIPTION			
6		00 00 1			0 00 0			Assignment entry			
7		07 00 0						Constant data			
2	001	07 01 0						(decimal point)			
2	002	07 02 0						00 (previous district)			
2	002	07 03 0						00 (previous state)			
2	001	07 04 0						≡ (group mark)			
7		08 00 0						Input record			
5	002	08 01 0						District			
5	002	08 02 0						State			
5	020	08 03 0						Salesman			
5	007	08 04 0						Sales			
7		09 00 0						Print record			
5	002	09 01 0						District			
5	003	09 02 0						Blanks			
5	002	09 03 0						State			
5	003	09 04 0						Blanks			
5	020	09 05 0						Salesman			
5	003	09 06 0						Blanks			
5	008	09 07 0						Sales			
5	001	09 08 0						Blank			
					Program						
1	.	01 01 0	SET	01	0 00 1			Prepare storage unit 1			
		02	LOD	01	07 04 0			Load group mark			
		03	UNL	01	09 08 0	+	001	Unload group mark in print area			
1		04	SET	02	0 02 0			Prepare storage unit 2			
1		05	SET	03	0 00 4			Prepare storage unit 3			
1		06	SET	04	0 00 2			Prepare storage unit 4			
		07	LOD	01	07 01 0			Load decimal			
		08	UNL	01	09 07 0	-	002	Unload decimal point into sales			
		02 01 0	RAD	00	08 04 0			R add sales			
		02	SPR	00	09 08 0			Store for print sales in print area			
		03	RCV		09 04 0	+	001	Select area for transmission			
		04	TMT	02	08 02 0	+	001	Transmit salesman			
		05	LOD	03	08 02 0			Load state and district			
		06	CMF	03	07 03 0			Compare to previous state and district			
		07	TRE		04 01 0			Transfer on equal to print			
		08	TRH		03 01 0			Transfer on high			
1		09	HLT		0 00 1			Stop			
		03 01 0	LOD	04	08 02 0			Load state number			
		02	UNL	04	07 03 0			Unload state no. in constant area			
		03	UNL	04	09 03 0			Unload state no. in print area			
		04	LOD	04	08 01 0			Load district no.			
		05	CMF	04	07 02 0			Compare to previous district no.			
		06	TRE		04 01 0			Transfer to print			
		07	UNL	04	07 02 0			Unload district no. into constant area			
		08	UNL	04	09 01 0			Unload district no. into print area			
1		04 01 0	SEL		0 40 0			Select printer			
		02	WRE	00	09 01 0	-	001	Write and erase record			
		03	TR		01 07 0						

## APPLICATION Carriage Control - Problem 40

CLASS	LENGTH	SYMBOLIC LOCATION	OPERATION	ACCUM.	ADDRESS	ADDRESS INCRE- MENT	SIGN	DATA OR DESCRIPTION
						±		
		01 09 0	Rad	05	07 05 0			R add 0
		10	Rad	06	07 06 0			R add 1
		03 09 0	Unl	05	09 01 0	- 002		Unload 0 in print line for double space
		04 01 1	Trs		04 05 0			Channel 12
		04 05 0	Unl	06	09 01 0	- 002		Unload 1 in print line
1		06	Iof					Turn off I/O indicator
		07	Tr		04 02 0			To write record

## APPLICATION Normalize and Transfer - Problem 41

CLASS	LENGTH	SYMBOLIC LOCATION	OPERATION	ACCUM.	ADDRESS	ADDRESS INCRE- MENT	SIGN	DATA OR DESCRIPTION
						±		
6		00 00 0			0 20 0			Assignment entry
7		06 00 0						Constant data
2	001	06 01 0						\$ (dollar sign)
2	001	06 02 0						. (period)
2	001	06 03 0						* (asterisk)
2	001	06 04 0					+	1
2	004	06 05 0						Address of dollar
2	004	06 06 0						Control address of asterisk
2	004	06 07 0						0000 calculated address (control counter)
7		01 00 0						Normalize and transfer problem
1		01 01 0	Set	02	0 00 1			Prepare storage unit 02
		02	Lod	02	06 01 0			Load dollar sign
		03	Unl	02	07 01 0			Unload dollar sign in output record
		04	Lod	02	06 02 0			Load decimal
		05	Unl	02	07 06 0			Unload decimal in output record
		06	Lod	02	06 03 0			Load asterisk
1		07	Set	03	0 00 4			Prepare storage unit 3
		08	Rad	04	06 04 0			R add constant 1
		02 01 0	Lod	03	06 05 0			Restore control
		02	Unl	03	06 07 0			Address
		03	Ntr	01	03 01 0			Transfer if zero in amount
		04	Spr	01	07 09 0			Print normalized amount
		05	Tr					Continue main routine
		03 01 0	Adm	04	06 07 0			Plus 1 to address of *
		02	Lod	03	06 07 0			Adjusted address
		03	Unl	03	03 04 0			Unload to next step
		04	Unl	02	07 02 0			Put asterisk in print line
		05	Cmp	03	06 06 0			Compare to control address
		06	Tre		02 04 0			Transfer to print amount
		07	Tr		02 03 0			Transfer to repeat normalize

